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ABSTRACT

This digest comments on various aspects of school science fairs. General expectations for science fair projects and participants are discussed, and tips for choosing a topic and completing a project are given. Organizational strategies for teachers charged with conducting science fairs are presented. Guidelines for parents in helping children with science fair projects are considered. (WRM)

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Wendy Sherman McCann

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Has your child suddenly become interested in determining which laundry detergent produces the most suds? Have you noticed growing collections of magnets, wires, and batteries lately? Is there unfamiliar talk about *hypotheses, dependent variables*, or *problem solving*? If so, then you may be feeling the effects of a *Science Fair*, an annual event where students are encouraged to design and carry out scientific investigations and compete for various levels of recognition.

Participation in science fairs provides a means for students to "think like a scientist." The types of projects that students are expected to complete vary by grade level. Younger students may simply build models, make collections, or prepare exhibits that include demonstrations of scientific phenomena. Older students are often expected to formulate and test scientific hypotheses through controlled experiments. Some schools allow students to complete group projects, but others require individual work. Students may be asked to present project results to teachers, classmates, or outside judges for evaluation. Science fair projects are expected to be based on the "scientific method," which is a simplified model of the way scientists perform their own investigations. The scientific method is generally described as comprising the following components: a statement of a scientific problem; a hypothesis (or "educated guess") as to what an answer to the problem might be; an experimental procedure designed to test the hypothesis; and an analysis of the experimental results, including, if necessary, a revision of the initial hypothesis. Students are required to demonstrate the use of the scientific method in carrying out their science fair investigation.

Students sometimes have difficulty choosing science fair topics, but usually a wealth of options exists. Although topic categories vary among different science fairs, the most commonly accepted ones include: Behavioral/Social Science (Psychology/Sociology); Biochemistry/Microbiology; Botany; Chemistry; Engineering; Environmental Science; Earth/Space Science; Medicine/Health Science; Mathematics/Computer Science; Physics; and Zoology. Once a student has selected a topic category of interest, he or she will need to develop a specific question which can be investigated scientifically. A question that is very broad (for example, "What can be done about pollution?") will not generally lead to an acceptable investigation. If you are helping a student develop a project, you will want to help him or her choose a question for which an answer can be determined through direct observation and experimentation. For example, "How does acid rain affect plant cell structure?" Some science fairs may allow invention-type projects (for example, "Design a utensil for eating peas."), but not all do. Keep in mind that most science fairs have strict rules about experimentation on humans and animals, so make sure your child is aware of any restrictions which will apply to the chosen project. Knowing the rules and expectations ahead of time will help you avoid problems or even disqualification down the road.

Most local and state science fairs call for students to display the results of their investigations through poster presentations. Teachers and judges look for neat, attractive displays. A familiar strategy is to present information on an upright, self-standing backboard. There may be specific requirements for how the information is to be presented on the backboard, but most include the title of the project, a summary of procedures followed, observations and data collected, and conclusions drawn. Whenever possible, graphs and tables can be used to summarize collected data or other information. Often, written and oral reports are also required. Well-organized documents and speeches will enhance a science fair project's reception by teachers and judges. For students who are anxious about public speaking, it may be helpful to practice giving presentations to supportive audiences such as family members or friends. If the oral presentation contains a question-and-answer session, this should be practiced, as well. Students may dread answering questions from teachers or judges, but having some non-threatening experience with this procedure can give students the confidence they need when an actual evaluation takes place.

In a science fair, students may have the opportunity to compete for recognition, or

Tips for Teachers

- Prepare a list of project ideas for students to use when trying to select research topics. You can get ideas from previous student work, magazine articles, television science shows, newspaper stories, science fair websites, science fiction books, and "winning projects" lists available from state or national fairs. It is helpful to keep a database of ideas from year to year for students to use.
- Have clear documentation of all rules and procedures for everyone involved in the science fair, including students, parents, and judges. If you are in charge of organizing a school fair, you may want to model your rules after the district or state rules. That way students will already be familiar with procedures when competing at various levels. Keep tabs on student project plans and guard against illegal, dangerous, or other problematic investigations.
- Enlist the help of colleagues in preparing your students. Math, English, and art teachers may have helpful information for students preparing their data analysis, reports, and presentations. Often, colleagues can cover topics relevant to science fair activities in their own classes.
- Keep a database of judges' names and contact information. Consider inviting teachers from neighboring school districts, local college and university professors, preservice science teachers, and parents who are involved in science-related professions.
- Anticipate problems your students may encounter during the actual fair. You can pack a science fair "survival kit" which would include items such as glues, markers, scissors, batteries, small tools (screwdriver, utility knife, and hammer), extension cords, a dictionary, and a sewing kit.

Note: These tips were adapted from *Science Fair Spelled W-I-N, First Place Tips for Students, Teachers, & Parents* (1992), by Carl Tant.

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awards and scholarships. It is helpful to keep in mind that state and regional science fair judges may be asked to rate students in any or all of the following areas: evidence of scientific thought; ingenuity and originality of the project; completeness of the investigation, including background research; level of scientific or engineering skill involved in the project; clarity of display and presentation; and attractiveness of the display. Your student will be well-prepared for competing in a science fair if attention has been paid to developing each of these aspects of the project. Although the commitment can be major, completing a science fair project will help students learn about science concepts and scientific ways of investigating the world around us.

Many students enjoy participating in science fairs, but others may need a bit of encouragement from teachers and parents. You can help ensure that a child's experience is a positive one by taking the following steps:

- Encourage the student to choose a project topic that will sustain his or her interest. Because this investigation will be carried out over a longer period of time, the student should be motivated to study the chosen topic.
- Help the student prepare a realistic timeline for completing the project. Most science fair investigations take a significant amount of time to complete and analyze. Be sure to allow time for mistakes and revisions— waiting to complete a science fair project until the night before the due date will never result in a satisfying experience!
- Gather incidental materials early. Take time to think about the project, presentation, and the materials needed to have a neat, attractive display. Plan to photograph appropriate aspects of the investigation for later display on background posters.
- Make sure the student is aware of all project assignments and deadlines. Some teachers require literature searches, written reports or in-class presentations in addition to the investigation itself.
- Be a supportive "practice audience" for the student. Many science fair contests require that an oral report be given to one or more judges who can then ask questions about the investigation. Listen to your student perform a practice run, and try to anticipate questions the judges may ask. Teachers can help by providing judging criteria for students and parents to consider.

Ideas For Science Fair Projects

- Does the size or breed of a dog affect its heart rate?
- What container will keep a drink cold for the longest period of time?
- Are paper grocery bags stronger than plastic grocery bags?
- Which kinds of cereal get soggy the fastest and stay crunchy the longest?
- Do members of the same family tend to have the same favorite color?
- Do taller people have bigger feet?
- Are snails attracted or repelled by light?
- Will a seed grow if part of it has been removed?
- Are guppies attracted to mirrors?
- Can you train an earthworm to do something?

Note: These ideas were selected from *Science Fair Projects: A Guide for Grown-ups*, produced by the Education Division of the American Chemical Society [SE060393])

Selected Resources About Science Fairs

The CSMEE Science Fair Companion http://www.ericse.org/scifair.html

Super Science Fair Sourcebook (1996), by Maxine Haren Iritz. Published by Learning Triangle Press, 11 West 19th Street, New York, NY 10011; 248 pages. [ISBN-0-07-032849-8]

The Complete Handbook of Science Fair Projects, Revised Edition (1996), by Julianne Blair Bochinski. Published by John Wiley and Sons, Inc., 605 Third Avenue, New York, NY 10158-0012; 221 pages. [ISBN-0-471-12377-3]

Science Fair Spelled W-I-N, First Place Tips for Students, Teachers, & Parents (1992), by Carl Tant. Published by Biotech Publishing, P.O. Box 1032, Angleton, TX 77516-1032; 110 pages. [ISBN-1-880319-02-0]

Steps to a Science Fair Project

1. Select a topic
   Remember, a science fair project is something you do to find an answer to a question.
2. Gather background information
   Gather information from books, magazines, the Internet, people, and companies; keep notes about where you got your information.
3. Scientific Method
   - State the purpose of your experiment: What are you trying to find out?
   - Select a variable (something you will change/vary) that will help you find your answer.
   - State your hypothesis—your guess about what the answer will be.
   - Decide and describe how you will change the thing you selected.
   - Decide and describe how you will measure your results.
4. Run an experiment and record data
   Keep notes in one place. Write down everything you can think of; you might need it later.
5. Graphs and charts
   What happened? Answer that question, then put the results in graphs and charts.
6. Construct an exhibit or display
   It has to be neat. Make it fun, but be sure people can understand what you did. Show that you used the Scientific Method.
7. Write a short report
   Tell the story of your project; tell what you did and exactly how you did it. Include a page that shows where you gathered background information.
8. Practice your presentation to judges
   Practice explaining your project to a parent, friend, grandparent, or someone else you trust.
9. Go to the Fair and have fun!

Note: These guidelines were adapted from the following webpage: http://www.isd77.k12.mn.us/resources/cf/

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